DOCUMENT RESUME

ED 228 910 HE 016 013

AUTHOR James, Arthur
TITLE Exploring Strategies of Assessment and Results in the Spanish Universidad Nacional de Educacion a Distancia and the United Kingdom Open University.
INSTITUTION Open Univ., Walton, Bletchley, Bucks (England).
PUB DATE 82
NOTE 60p.; For related document, see HE 016 012.
AVAILABLE FROM The Open University, London Region, Parsifal College, 527 Finchley Road, London, NW3 7BG, England.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Academic Achievement; Academic Persistence; *Comparative Education; Evaluation Methods; *Extension Education; *External Degree Programs; Foreign Countries; Higher Education; *Student Evaluation
IDENTIFIERS Distance Education; *Open University (Great Britain); *Universidad Nacional de Educ a Distancia (Spain)

ABSTRACT

The strategies of student evaluation and the patterns of results are compared for The Universidad Nacional de Educacion a Distancia (UNED) in Spain and The Open University of The United Kingdom. Both universities operate a system of undergraduate subject credits leading to a degree, but the length of the courses of the two systems differ. UNED assesses students only through examinations, while Open University uses both coursework and examinations. In comparison to UNED's system, Open University has a tighter framework of rules by which examinations are devised and organized, students are assessed, and pass lists are developed. Undergraduate data for 1977-1980 are compared for the two universities concerning enrollments per course, number of students taking the examinations, and number of students awarded credit. The detailed statistical analyses cover the effects on the final pass rate of the percentages of students taking the examinations and the specific course. An explanatory model that includes student behavior, personal characteristics, and academic environment is proposed to explain the differences in results. Additional factors that are suggested as possible causes of the differences in results are: database differences, cultural differences, and differences in the assessment strategies. (SW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED228910

Exploring Strategies of Assessment and Results in the Spanish Universidad Nacional de Educación a Distancia and the United Kingdom Open University

Arthur James
Faculty of Educational Studies
The United Kingdom Open University

Published in Universidad y Sociedad, No. 4, (1982) (Spain) under the title Una Comparación de las Estratégias de Evaluación y los Resultados de la Universidad Nacional de Educación a Distancia de España y de la "Open" de Inglaterra

HE 016 013

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Open Univ of the United Kingdom
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PURPOSE OF THIS STUDY

In Spain today (1981) around 32 thousand men and women (1:1200 of a population of 37.4m) are studying for a título of Licenciado in one of eleven different carreras with the Universidad Nacional de Educación a Distancia (UNED, 1981:18). Most of these students work for a living and study part-time at home with specially-designed self-instructional materials. At the same time, in the United Kingdom, around 61 thousand men and women (1:950 of a population of 56.0m) are studying in similar circumstances for degrees of the Open University. (OU, 1981:12). The UNED began its first courses in 1973, some two years after the Open. Now that both of these distance-learning universities have presumably got through their gestation periods, it might be interesting to compare results so far.

Since the early 1970's higher education has witnessed an explosion of interest worldwide in distance education. Numerous reports have been published, but there is a dearth of explicit comparative studies. Interpreting the material in those reports implies comparison with background knowledge either explicit or implicit. For some kinds of information, particular numerical data, explicit comparisons would be useful. For example, is a pass rate per subject of 50 per cent a lot or a little?

But if one could see one university's rate explicitly compared this would help. At the outset I recognise that possible differences between groups that exist naturally, as here, as distinct from those created artificially in experiments, do not "prove"anything or do not directly support an inference concerning a cause-and-effect relation. The relation is associative rather than casual. For example, differences in dropouts or pass rates between students of one system and another does not necessarily mean that one system is "better" or "worse", that students responses would change were a similar system adopted. But comparative studies may give clues to the processes responsible - the beginnings of "explanation".

In the exploration of the academic side of the two universities my end-in-view is to point up and to describe summarily the important features of the undergraduate course results (level, spread, shape) to give a normative data base so as to give insights and ideas for discussion, and perhaps to raise questions and suggest hypotheses for further study.

BACKGROUND

The planning, early development, and modus operandi of each university is well documented elsewhere (García Garrido, 1976; James, 1982a; Open University, 1981; Perry, 1976; UNED, 1976). James (1982b) has produced a contrastive analysis of some of the major features of organisation, practice, and outcomes of the two universities, of which the content of this paper, in less detail, is covered.

It is important to bear in mind that Spain and the United Kingdom each has its own cultural traditions, and with the possibly different educational needs and wants linked to social, intellectual, and technological change, this may lead to different ideas for educational practice. In Spain in particular, the rapid socio-cultural changes and advances that have taken place since the early sixties are causing considerable difficulty in Spainish higher education, which Horowitz (1974) looks at from an economist's point of view and Villanueva (1980) from an educationist's. But on the ideology behind the concept of distance learning both the UNED and the Open share common ground.

Here I describe how the two groups of students work toward their degrees through a system of subject credits, and the way the university staff assess performance for decisions whether or not to award a subject credit. This information is crucial to know since there is the possibility of a cause-effect relation between strategies of evaluation and patterns of results, as James (1973) has argued.

A "Subject" Credit System

Both the universities are similar in that they operate a system in which their undergraduates accumulate sufficient "subject credits" to be entitled to the award of a degree. But there are some important differences in detail.

The term "course" - curso in Spanish - has a different connotation in both universities. In the UNED, as in conventional Spanish universities, a curso equates with a full year's study in which a student takes five or six different subjects called asignaturas. Students follow five cursos, the first three general in nature, the second two more specialised. In UNED a student has a choice of eleven different programmes of study called carreras. The system operates on fixed programmes; there are no electives. A students must pass around 25 - 30 different asignaturas of a carrera to claim a Licenciado. The Spanish Licenciado degree is generally considered to be of equal status with a British BA (Hons) or BSc (Hons) degree, although the general level of a five year course should be higher than a British 3 year first degree.

The Open's system differs radically from UNED's. There a student is "open" to choose any course he likes from any one of six faculties. "Course" in this context means "subject"; these are much longer than an asignatura. Courses may be full or half credit. To get an Ordinary Bachelor's degree the Open student must acculmulate six full credit equivalents and for Honours eight. He can pick courses from any faculty, but in practice his tendency will be limited to two.

So although an UNED undergraduatecan accumulate course credits without time constraints like his counterparts in the Open, unlike that counterpart he has more legal constraints on choice, and, with 25 - 30 asignaturas to contend with, apparently a longer haul to get his degree.

From now on when I use the term "course" I mean the carrera asignatura when I talk about the UNED data, and faculty course (irrespective of whether it be of half or full-credit status) when I talk about the Open data.

The Assessment System

This is markedly different in the two universities.

Assessment in the Open combines marks for a student's performance in his course work with those on a three-hour end-of-session examination (October/November) in a ratio usually of 50 - 50. (Open University, 1979). In sharp contrast the assessment in the UNED depends almost wholly on the marks a student gets on two formal examinations, each of one to two hours in length, held in February and June. For the award of a credit the student must pass both (UNED, 1979). A course work component (continuous assessment) is not used because of fears of cheating and costs of monitoring.

Differences are also seen in the organisation and planning of examinations. In the Open an examination and assessment board is set up for every course. The board includes the chairman of the course team (courses in the Open are the result of a team rather than an individual effort as in conventional universities), internal examiners (staff members), and two external examiners. These are usually "experts" from other universities who try to ensure a comparability of level of standards across universities. Each board moderates the continuous assessment, compiles the examination paper, and determines the pass lists. The boards work within guidelines set by the university. Where there are more than 250-300 candidates for the examination, script markers are appointed by the examinations and assessment board from experienced parttime

tutors. Samples of script marking are monitored by team leaders to reduce the likelihood of different marking standards.

In the UNED each member of the central UNED academic staff is in charge of at least one asignatura, depending on the numbers of students enrolled. His is the task of writing the examination question and issuing instructions for marking.

In the Open examinations candidates are allocated to any one of 134 examination centres throughout the United Kingdom closest to where they live. Students who fail may be permitted to resit on condition of their passing the continuous assessment component of their work; otherwise they must take the whole course again.

In the UNED the examinations take place in the 52 Centros Asociados scattered throughout Spain; a student will be examined in the Centro to which he is attached. If he fails, he has a third chance of resitting in the following September.

The point we make here is that in the Open the team of internal and external examiners devise and organise the examinations, assess the performance of candidates, draw up the pass lists and work within a tighter framework of rules than their counterpart in the UNED. (The Open University, 1978). It is a much more complex and weighty operation.

METHOD

Undergraduate Data

UNED's data covered 268 asignaturas produced for ten different carreras over 1977-1980, making a total of 1014 results and a student-course volume of 453,540 on initial registration. The Open's covered 123 courses of half or full-credit status produced for six different faculties over the same period, making a total Of 454 results and a student-course volume of 305,705 on final registration. Student-course numbers equal course units times volume. (See references for sources).

The distinction between the terms "initial" and "final" registration is crucial to the analysis and the drawing of comparisons and conclusions. The Open system includes a gestation period of some three months at the beginning of a course when a student can decide whether or not to continue or abandon. So there are two registrations: conditional (i.e. initial) and final. On average about 25 percent of the Open students abandon the course for which they conditionally enrolled. For the purposes of this paper students who abandon courses are called "abandoned" to distinguish them from dropouts - those who abandon the university altogether. By contrast the UNED has no such system because of the administrative costs. So the two baselines for computing results are not equal. This means that the Open's results in comparison with UNED's may look better than they actually are.

Omitted from the data were the numbers of students on a) the Admissions course and b) the In-Service courses for teachers of Business Studies and teachers in elementary schools (Programa Nacional de Especialización y Perfeccionamiento del Profesorado de Educación General Básica). Although these features are most important and worthy of assessment, I had to exclude them because the Open runs no comparable scheme. Excluded also were numbers from the UNED's Psychology department which began only in 1979 with five asignaturas. From the Open's results are excluded Associate studentships. These are numbers who enrol for single courses with no commitment to take a degree.

The results data covered both numerical and categorical variables in numbers of students a) enrolled per course, b) presenting for examinations and c) approved for the award of a credit by carrera (UNED) or faculty (Open) and year. So as to give a suitable base for comparisons the numbers were re-expressed as ratios.

%b/a = Percentage of numbers examined: numbers enrolled

%c/b = Percentage of numbers passed: numbers examined

%c/a = Percentage of numbers passed: numbers enrolled

These three categories of numerical results are interlinked: the fewer or more the students who present for examinations, the fewer or more examination passes. The % b/a gives some idea of course abandonment; the % c/b the variability in examining.

Appendix A presents a second stage abstract of the numbers analysed. Values for the individual courses are excluded because of space constraints. The columns in the Appendix identify the ten UNED departments (carreras) and the six Open faculties while the rows denote the year of assessment. Each cell contains the numbers for each of the three categories of enrolment, examination, approval.

Enrolment

There are large differences in enrolment for each faculty in both universities. Median enrolment per carrera in the UNED over the four years amounts to 35,000 student-asignaturas; and for the same period in the Open it is 47,000 student-courses. But the spread around those medians is very great in the UNED with around 145,000 enrolling for Law and only 12,000 for Chemistry. In the Open the variation is not as great, with the Arts having the greatest enrolment of 81,000 student-courses and Education only 30,000. This has implications for averaging: a very good or very poor result in a carrera or faculty with a large enrolment will raise or lower results substantially.

Data Reduction Techniques

The general characteristics of the undergraduate data suggested that for my purpose the techniques of Exploratory Data Analysis (EDA) would be more appropriate, rather than the more traditional means, standard deviations, and analysis of variance, since I was not testing hypotheses. EDA methods are described by Erickson and Nosanchuk (1979), and derive from pioneering work of Tukey (1977); they are argued to be more suitable for sociological type data which is often "dirty". EDA method emphasises measures of central value and dispersion from normality, visual displays, and several summary statistics to describe batches of data.

Focus in this study is on five features of the data which enable quick comparisons of batches of numbers. They are:

Level	How big the numbers were on average.
Spread	How spread out or compressed the numbers are.
Shape	How the numbers were distributed across the range of values
Clumps	How they bunched at points in the distribution.
Outliers	How some numbers had exceptionally low or high values.

The sequence of analysis is first to summarise, display and interpret the big and noticeable features of the data for the two universities as a whole, and then to look at carrera (UNED) and faculty (Open) and year of assessment effects.

RESULTS

Overall Comparisons

A quick summary of the important features is seen in Table 1. These show the flow of group levels, the extreme values, and how the values "spread" around the levels.

For the UNED the median shows that for the average asignatura just over a half (52 per cent) of the students presented themselves for the two examinations, of these just over two thirds (69 per cent) passed giving a final pass rate of one third (32 per cent). For the Open more than two thirds (70 per cent) sit their examination, nearly all (91 per cent) pass, giving nearly two thirds (63 per cent) a pass. So, twice as many Open students pass their courses as do UNED.

In both universities abandonment of courses has a greater weight than examination failure. Half the UNED fail to sit their examinations and one third of the Open; but even in the examinations nearly a third of the UNED students fail while nearly all the Open students pass.

If the distance between the Upper and Lower Quartile is taken as a measure of spread around the levels quoted, then in all three categories UNED's spreads are considerably bigger. The Open's are more compact. Again, if the range is considered, UNED's values

Table 1

Numerical Summary of Undergraduate Course Results over 1977-1980
(Rounded to nearest one per cent)

Feature	Group	Result Category		
		% Examined / Enrolled	% Passed / Examined	% Passed / Enrolled
Highest Value	UNED	100	100	100
	OPEN	91	100	87
Upper Quartile	UNED	72	85	47
	OPEN	76	94	70
Median	UNED	52	69	32
	OPEN	70	91	63
Lower Quartile	UNED	37	50	22
	OPEN	62	87	56
Lowest Value	UNED	9	0	0
	OPEN	26	49	23

cover almost the whole range of results, whereas those for the Open do not. Whereas, for instance, examination passes run from 0 - 100 per cent in UNED, they run from only 49 - 100 per cent in the Open. Final passes run from 0 - 100 per cent in UNED but only 23 - 87 per cent in the Open.

These results do not take account of the volume of students on courses; they are the results for the average courses. When volume is taken into account, a different picture emerges, as seen in Table 2.

Now, just under half (44 per cent) of UNED students take the examinations, two thirds (63 per cent)pass, which means that just over a quarter (28 per cent) pass. In other words the levels for each of the categories is lower. By contrast, they are higher in the Open except for the passed:examined category where they are virtually identical. Three quarters (74 per cent) of the Open students take examinations, the majority (90 per cent) pass, which gives a pass rate of two thirds(67 per cent) of those originally enrolled. Again it can be seen that abandonment of asignatura or course carries more weight in determining the result than examination failure.

These discrepancies are due to a combination of weighing effects and skewed distributions. In the Open, Foundation course students account for around one third of the total student-course volume. Since Foundation courses tend to show relatively high levels compared with second and third level courses, this tends to pull up the averages. Similarly with UNED: not only do we see discrepancies in the volume of students in each faculty, there are also large differences within faculties. In Law for instance, some courses may have as many as 3000 students enrolled in contrast to others with only 200. High or low volume can pull the weighted averages up or down.

Table 2

Comparison of Median versus Weighted Means

Result Status	Measure	Group	
		UNED	Open
% Examined / Enrolled	Median	52	70
	Weighted Mean	44	74
% Passed / Examined	Median	69	91
	Mean	63	90
% Passed / Examined	Median	32	63
	Mean	28	67

Further analysis of the distributions of course results within carreras (UNED) and faculties (Open) showed that in the Open only one third (35 per cent) of the courses achieved results as good as the weighted averages in both the enrolled:examined and examined:passed categories. It would be expected to be nearer a half. By contrast, two thirds of UNED's carreras (65 per cent) were above the weighted mean norm in the examined:enrolled category, and over a half (57 -58 per cent) in the two other categories.

Each measure then tells its own story: if interest is in how the average student gets on irrespective of his or her course, then the weighted mean is a better estimate of level. But if interest is in how the student gets on in his or her course, then the median is the better measure.

If the main features of the distributions are plotted (Figure 1) clear differences between the universities can be seen at a glance.

These features (abstracted from Table 1) are the level (here:median points), the spread (here: the middle half of the data represented by the upper and lower quartile difference), and the outliers (here: values greater or less than the Upper/lower quartiles plus or minus a step of 1.5 times the spread). The "step" as equivalent in value to 1.5 times the spread is a "rule of thumb" for identifying exceptional values (outliers) in an array of data; outliers are worthy of special attention.

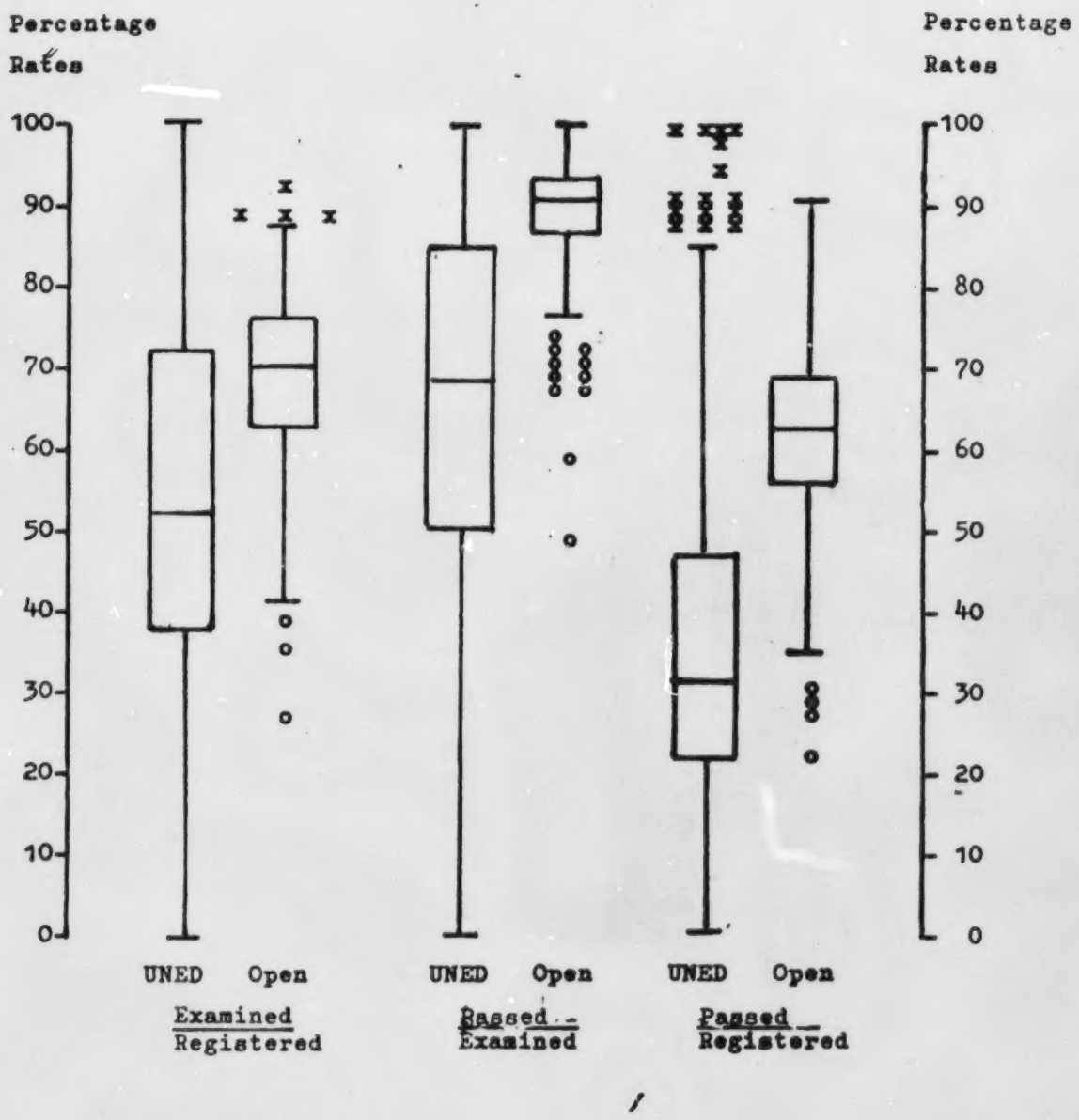
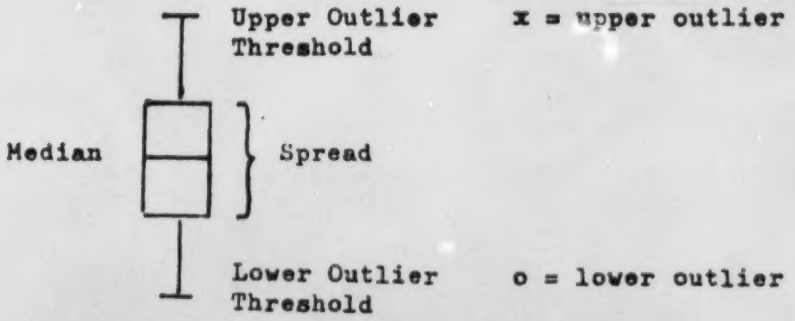


Figure 1 Comparisons of Plots of Undergraduate Course Results in the UNED and the Open over Four Academic Years 1977-1980

KEY:



If we focus on the box in Figure 1 (spread) and the bar within the box (median point) the message here is that while level increases as we go from the UNED to the Open, the spread decreases; the Open results are more compact. This means that for the Open the level by itself provides a better guess relatively of the characteristics of the various results than it does in the UNED. The low spread means consistency which means better predictions. Results in the UNED are erratic as evidenced by the wide spreads and that makes prediction, if such an event be considered of importance, more difficult.

The other details in the plot (Figure 1) are equally interesting. The whole range of results which could be construed as "normal" within our scheme of analysis, is for the UNED twice the size of that of the Open and five times greater for course results in the passed :examined category. What would be considered exceptionally low or high results in the Open would not be recognised as such in the UNED. Table 1 shows that values ranging from 0 - 100 per cent in result rates for the three categories are recorded for the UNED. Except for the passed:registered category such results would not be recognised as "exceptional". In that category there are 15 outliers at the upper end of the range: but these equal only just over one per cent of the total number of courses presented over four years. Were that figure say five or ten per cent then perhaps a detailed inspection would be worthwhile to check any patterns e.g. bias toward certain carreras.

The numbers of outliers in the Open results are also relatively small. The largest number (11) are seen in the passed:examined category, but here again they represent only about two and a half per cent of the total course distribution. What is interesting here is that rates of 0 or 100 per cent would be exceptional in the Open except at the top end for passed:examined. Rates lower than about 40 per cent for examined:registered, 75 per cent for passed:examined, and 35 per cent for passed:registered would be considered exceptionally low in the Open, whereas they would not be in the UNED. At the positive end of the range rates of around 90 per cent or more for course passes of enrolled students would be exceptional in both universities. It would also be an exceptional result in the Open if any course had more than 90 per cent of its enrolled students taking the examinations.

One last technical point is worthy of note. The position of the horizontal bar in the boxes (Figure 1) shows the relation of the median point to the upper and lower quartiles. Where it is off-centre this indicates skewness in the distribution.

Shape of Distributions

Although the plots (Figure 1) show symmetry or asymmetry quite well, they do not clearly show the shape of the distributions such as whether the values are single or multiple peaked or bunched relatively closely together. The shape can be conveyed better through a separate figure (Figure 2).

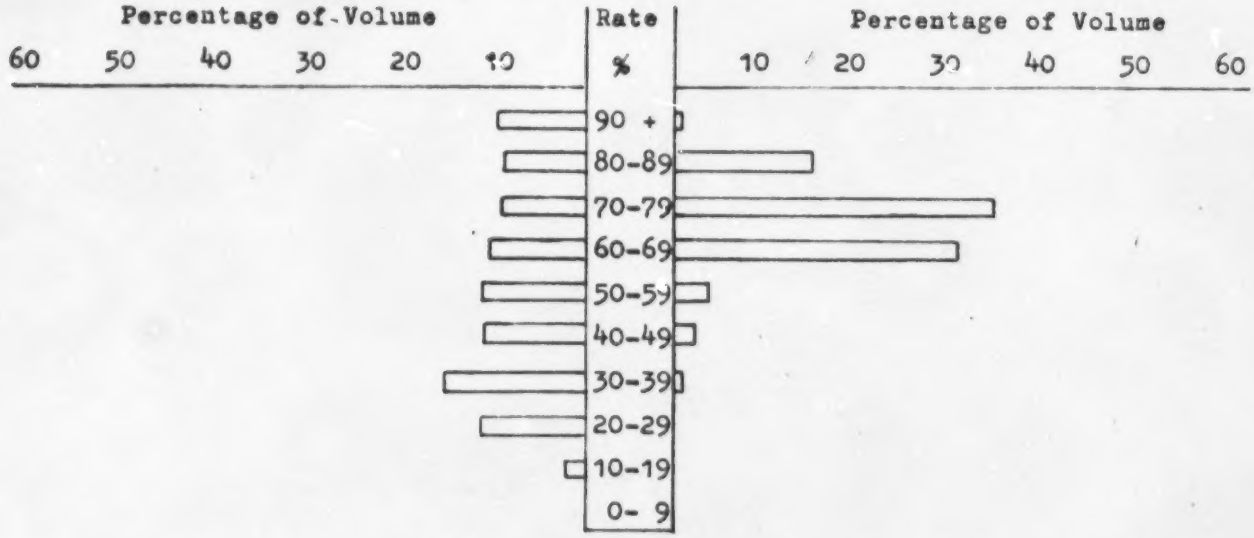
Again the contrasts between the two universities could not be sharper. As we move from the UNED to the Open we see that the Open results tend more to bunch or clump towards the higher end of the scale in contrast to the UNED where they are well spread out.

If we take and compare each category separately we observe the following differences:

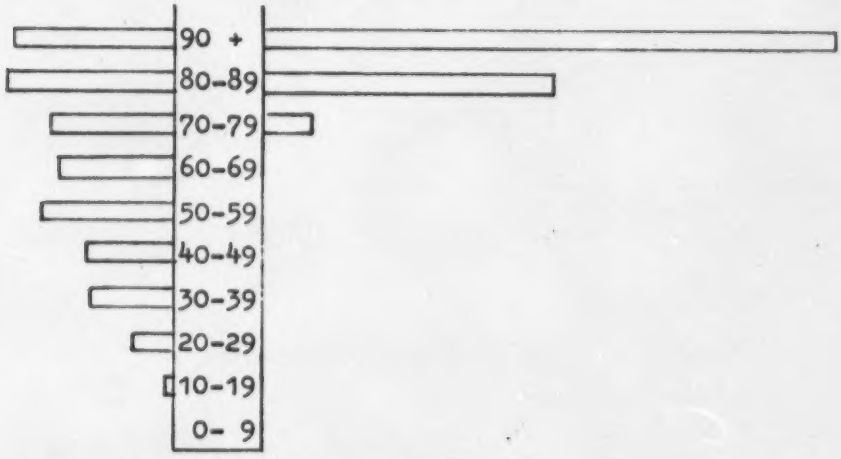
Examined:Registered The UNED distribution is rectangular with roughly equivalent proportions in each class interval from 20 per cent rates upwards; the Open distribution is symmetrical but values are clumped within a range of 50 per cent upwards.

Passed:Examined While the values are very bunched in the Open at the top end, they tend to be negatively skewed in the UNED.

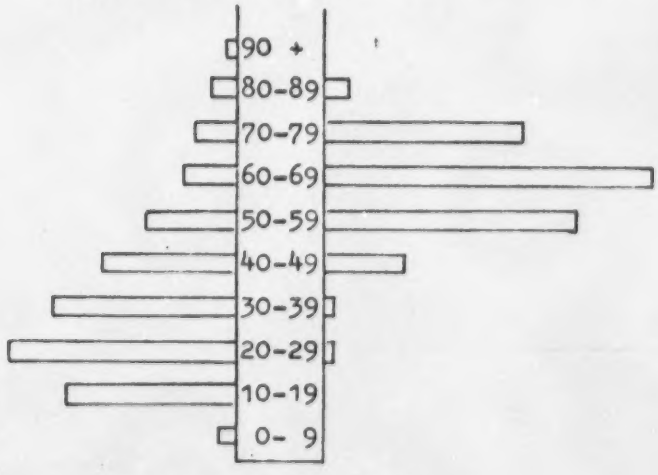
Passed:Registered: A strong positive skew is observed here in the UNED distribution with lower values tending to bunch together. Again this shape contrasts with the Open's where the distribution is symmetrical with less evidence of bunching.



Registered Students Examined



Examined Students Passed



Registered Students Passed

Figure 2: Comparison of Distribution of Results over Four Years 1977-1980

UNED = 1014 Asignaturas Open = 454 Courses

In sum: if the bell-shaped so-called "normal" curve is the standard for comparison - and I do not assume that distributions should match that model - then one sees that neither the UNED in particular nor the Open set of course distributions makes a particularly good fit.

Carrera/Faculty and Year of Assessment Effects on Result Statuses

The method employed was that of "Elementary Analysis" suggested by Erickson and Nosanchuk (1979, chap. 13). In essence it was a two-way analysis of the effects of two categorical variables (X_1 and X_2) on a numeric variable (Y).

The model to which the data were fitted was as follows:

$$Y' = \overline{Y} + X_1 + X_2 + \text{Error}$$

Y' is a predicted cell value of student-course result (i.e. faculty by year), X_1 and X_2 are carrera/faculty and year of assessment effects, Y is the grand median, and Error is a small fluctuation of value due to rounding of values to the nearest whole per cent and random factors. The goodness of fit of this model is judged by the size of the residuals after fitting the model. The grand median is the median of the means for each carrera or faculty in a given year. Medians were used instead of the means to make effects more resistant to error through the technique of following the means analysis with a "median polish".
(See Erickson and Nosanchuk on this, 1979:276)

In such an analysis any pattern in the data residual like unusual values (outliers), curvilinear relations, goodness of fit, etcetera, could be rather hard to spot because of the large number of cell entries: these would be 40 for UNED (10 carreras x 4 years) and 24 for the Open (6 Faculties x 4 years). So to make interpretations

"visual" I followed Erickson and Nosanchuck's suggestion of making a plot of the residuals by replacing numbers with just three symbols.

X = an upper outlier (unusual or exceptional result)

0 = a lower outlier

. = a value considered "normal" within the distribution.

Upper and lower outliers are defined as values of the upper and lower quartiles respectively to which has been added the value of the "step", which is one and a half times the spread of values in the interquartile range.

Three comparisons are made, as before. Although the most interesting outcome is the proportion of originally enrolled students who actually pass, the other two comparisons are useful, because pass rates depend on them. They answer the question: do pass rates depend more on rates of subject abandonment or more on examination failure - or perhaps both?

Comparison One: Effects on Rates of Students Examined

Table 3 shows that less than half (45 per cent) of UNED students take the examination in the subject for which they have enrolled, compared with nearly three quarters (73 per cent) of Open students. Put in another way: more than half (55 per cent) UNED students abandon their subject compared with only a quarter (27 per cent) of Open students, and this must be a big factor in the figure for final pass rates.

But it is clear from the size of the row (i.e. Faculty) and column (i.e. year of assessment) marginal values that this figure will depend very much on a students carrera/faculty and even year of assessment, more so with the UNED students than the Open.

Carrera/Faculty Effects In both the UNED and the Open these are greater than year of assessment, as the marginal values show. In the UNED, what carrera a student is following could make a difference of 32 points (-11 to 21 per cent), to whether he takes his examination or not. In Philology for instance 66 per cent of students on average take examinations, in contrast with only 34 per cent in Chemistry. In relation to the overall average (Grand Median) these spreads are very large. Likewise in the Open the sort of Faculty a student is in for a particular subject, will make a difference of anything up to 11 per cent (-5 to 6 per cent). In Arts, for instance, 79 per cent on average take examinations in contrast to 68 per cent in Mathematics. Year of assessment effects are slight in comparison

TABLE 3

Comparison of Effects of Carrera/Faculty and Year of Assessment on Percentages of Examinees.

University	Year of Assessment				Faculty
	1977	1978	1979	1980	Effect
UNED					
Law	.	.	.	.	-4
Geography & History	.	.	.	.	11
Philology	.	.	.	.	21
Education	.	0	X	.	11
Economics	.	.	.	.	-6
Business Studies	.	.	.	.	-6
Physics	.	.	.	.	-4
Mathematics	.	.	.	.	-5
Chemistry	.	.	.	.	-11
Engineering	.	.	.	.	-6
Year Effect	-1	-9	-1	7	Grand Median = 45
OPEN					
Arts	.	.	.	.	6
Social Science	.	.	.	.	2
Education	.	.	.	.	-1
Mathematics	.	.	.	.	-5
Science	.	0	.	.	0
Technology	.	.	.	.	-2
Year Effect	2	1	-1	0	Grand Median =73

Variance in spread explained by models: UNED =46 per cent; Open= 70 per cent

Compared with the overall average, however, the spread of results in the Open is small, in sharp contrast to the UNED.

The row marginal in Table 3 shows that all the above average results in UNED are from one Faculty - Philosophy and Letters (Carreras: Geography and History, Philology, and Education). Students in these faculties score from 11 to 21 points above average in examination attendance. In other words, while a third of the Philosophy and Letters students abandon their asignaturas, two thirds do so on Chemistry. For the Open the contrast is less strong: Arts students are less likely to abandon their courses than Mathematics students. It is interesting to find a similarity in these outcomes: Arts appear to do better than Science.

Year of Assessment Effects Whereas in the Open data there are little or no effects to speak of, this is not so with the UNED, where the range is 16 points, about half that for carrera effects. In other words, asignatura abandonments are likely to differ from year to year. In 1978 abandonments were relatively high at around two thirds (64 per cent), but in 1980 they were just under a half (48 per cent).

In the Open results are much the same irrespective of year, ranging three points from highest to lowest.

Residuals Examination of the visual plot of the residuals in Table 3, which are the figures left after fitting the model, shows that the UNED and Open data fitted the model quite well. There are only three outliers observed overall. The variance in spread explained by the model of 46 per cent and 79 per cent for the UNED and the Open results, respectively, shows that the Open data made the better fit; nevertheless both values are high.

Education in the UNED had a particularly bad year in 1978, but an exceptionally good one in the following year. Inspection of the original data showed that in 1978 more than two thirds (70 per cent) of Education students abandoned their subject but in the following year this figure was reduced to less than a third (23 per cent).

The numerical residuals are not shown here for reasons given previously, but when inspected, these showed that the closest fit for the model was Mathematics and Chemistry. By contrast the worst fit was for the three carreras in Philosophy and Letters. The actual residuals (rounded to one per cent) were:

	1977	1978	1979	1980
Geography and History	-3	-10	9	3
Philology	8	-10	6	-6
Education	-4	-15	20	4

In other words, whereas abandonments were fairly constant across the years for the other carreras, in the Faculty of Philosophy and Letters there were irregular; there is an interaction of carrera with year.

For the Open the model fitted the bulk of the data quite tightly (i.e. smaller residuals) while showing the unusual character of the data which were not well fitted, which here is Science in 1978, which had an exceptionally low result (relatively) of 71.0 per cent, of students going through to examinations or about a third (29 per cent) of students abandoning subjects.

In comparing results, it should be observed that unusual or exceptional values in the data are relative to their populations. What would be called "unusual" in the Open would not be so in the UNED.

Comparison Two: Effects on Examinees Passed

Table 4 shows that the Grand Median sharply discriminates the students in the two universities, even more so than the previous outcome. Whereas nearly all students in the Open (90 per cent) who sit the examinations pass, only about two thirds of those in UNED (61 per cent) do so. But in both universities course abandonment is a greater causal factor in the overall pass rates than examination failure, but more so with Open than with UNED students.

There are no faculty or year effects to speak of in the Open, with only a point or so separating faculties and a fraction of a point either way from year to year. So the Grand Median is a good predictor of faculty results irrespective of faculty or year. But this is not the case for UNED.

Faculty Effects. These are very strong in UNED, evidenced by the row marginals in Table 4. The faculty a UNED student is in can make a difference of as much as 36 points to success or failure in examinations. Students of Law score easily the best results (84 per cent) and those of Engineering the worst (47 per cent), but the Law result is still lower than the average for the Open and , in fact, such a value would make it an unusually low value (outlier) in the Open data. But these are figures averaged over four years: the column marginals indicate strong year of assessment effects.

TABLE 4

Comparison of Effects of Carrera/Faculty and Year of Assessment on Percentages of Examinees Passed (Residuals from Median Polish Plotted)

University	Year of Assessment: 1977	1978	1979	1980	Faculty Effect
UNED					
Law	.	.	.	.	23
Geography & History	.	.	.	.	-2
Philology	.	.	.	.	-6
Education	.	.	.	.	-6
Economics	.	.	.	.	1
Business Studies	.	.	.	.	-1
Physics	.	.	.	.	-2
Mathematics	.	.	.	.	3
Chemistry	.	.	.	.	5
Engineering	.	.	.	.	-13
Year Effect	2	17	-9	-7	Grand Median =61
OPEN					
Arts	.	.	.	.	1
Social Science	0	.	.	.	-1
Education	.	.	.	.	1
Mathematics	.	.	.	.	0
Science	.	.	.	.	1
Technology	0	.	.	.	-1
Year Effect	0	0	0	0	Grand Median = 90

Variance in spread explained by model: UNED =45 per cent; Open = 60 per cent

Year of Assessment Effects These are considerably greater in UNED, ranging from - 9 to 17 points, a total of 26 points. The lowest UNED results were recorded in 1979 with examination passes of just over a half (52 per cent) and the highest in 1978, when three quarters (77 per cent) of students examined were passed. What is interesting to note here is that the peak pass year (1978) corresponds to the trough in students going forward to take their exams (see Table 3). Or to put this in another way: in 1978 student course abandonment was greatest and examination failure lowest. When proportionally fewer students sit their examinations, does that mean that some form of self-assessment mechanism is at work, that fewer means better? A similar phenomenon is noted in reverse for the 1980 results: an average number of UNED students sit their examinations (52 per cent), but a below average number pass(54 per cent).

In the Open results scarcely vary from year to year a fraction of a point either way; when the figures are rounded this reduces to nothing.

Residuals. Residuals for the Open data showed little scatter around their average, being about a point either way; by contrast the spread of residuals around their median in the UNED data was fourteen times greater. Yet no cell average in the UNED data reached a level where it could be categorised as "unusual", and therefore needing some explanation. Two outliers were identified in the Open data: both Social Science pass rates and Technology in 1977 were lower than predicted from the model, being 86 and 84 per cent, respectively, as against 89 and 91 per cent predicted. Why the results should be lower in this year, I cannot say.

When the numeric values of the residuals were inspected these showed an interesting trend. It was pointed out in the previous comparison that the Faculty of Philosophy and Letters combined results accounted for the bulk of abandonments in 1978. In passes relative to numbers examined, the same faculty seems to account for the exceptionally high value of 17 per cent above the four year norm in the same year.

The model to which the data were fitted again showed up well, as evidenced by the fact that it explained 45 per cent of the variation in the UNED data and 60 per cent in the Open.

Comparison Three: Effects on Overall Pass Rates.

Effects on Overall Pass Rates

Table 5 shows quite clearly that in both the UNED and the Open the carrera a student is following or the faculty that the Open course is in has a far greater influence in determining his or her pass rate over the four years than the year of assessment.

Carrera/Faculty Effects In the UNED this is evidenced by a range of 13 per cent (-6 to 7 points) around the average compared with only 4 per cent (-2 to 2 points) for year of assessment. In the Open it is the same story: 10 per cent (-4 to 6 points) difference as against 2 per cent (-1 to 1). But the difference in spread is twice that for the UNED.

Students of "verbal" subjects like Law and Philosophy and Letters are likely to score above average pass rates, while their counterparts in the Sciences, including Engineering, are likely to score below. An exception is Mathematics, where students score above average pass rates. For students in the Open the likelihood of an above average pass rate is with Arts and Social Science courses and the least likely in Mathematics and Technology. There is a certain affinity in these results with students in the "hare core" disciplines tending to do worse than others.

Year of Assessment Effects For all practical purposes results are much the same from year to year.

TABLE 5

Effects of Carrera/Faculty and Year of Assessment on Pass Rates

University	Year of Assessment: 1977	1978	1979	1980	Faculty Effect
UNED					
Law	X	.	.	.	5
Geography & History	.	.	.	.	4
Philology	X	.	.	0	7
Education	.	.	.	.	4
Economics	.	.	.	.	-2
Business Studies	.	.	.	.	-4
Physics	.	.	.	.	-3
Mathematics	.	.	.	.	0
Chemistry	.	.	.	.	-6
Engineering	.	.	.	.	-5
Year Effect	-2	0	0	2	Grand Median = 26
OPEN					
Arts	.	.	.	.	6
Social Science	0	.	.	.	2
Education	.	.	.	.	0
Mathematics	.	.	.	.	-5
Science	.	.	.	.	0
Technology	.	.	.	.	-4
Year Effect	1	0	-1	0	Grand Median = 66

These results depend of course on the numbers abandoning their work combined with numbers who actually pass or fail their examination. Here there was an interaction between carrera and year of assessment in the UNED figures. For abandonments and examination failures the figures were:

	1977	1978	1979	1980
Taking Examination	0	-10	4	7
Passing Examination	-4	16	-4	-8

Very generally speaking therefore the effects of different numbers of abandonments and examination failures tended to cancel out in determining the final result, as shown by the low year effect (Table 5). When fewer took the examination relatively more passed; and vice versa. But this was almost entirely due to the faculty of Philosophy and Letters, as the following figures suggest:

	1977	1978	1979	1980
Percentage Examined	55	35	50	66
Percentage Passed	56	84	64	44

When relatively large numbers of Philosophy and Letters students took the examination a greater proportion failed; and vice versa.

They had easily the smallest number of abandonments of less than half over the four years (44 per cent) but nearly the worst examination results with just under a half passing (44 per cent).

There were only minor fluctuations in effects due to year of assessment in the other carreras. Law had more abandonments than average with 60 per cent, but a very high pass rate of 79 per cent in the examinations. In Sciences and Engineering abandonment of asignatura as a determinant of pass rate is higher than average with 60-63 per cent, but the examination passes are quite near to the average with the exception of students of Engineering, who have a pass rate of 30 per cent. Their very low pass rate is due to both course abandonment (61 per cent) combined with low examination pass (50 per cent). Perhaps students on Science courses can better assess their progress and determine their chances in examinations than others.

In the Open the proportion between abandonments (easily the largest cause of failure) and examination passes (nearly all (91 per cent) pass) keeps more or less the same irrespective of year of assessment. Further analysis showed that there is a tendency for abandonments to increase as we pass from Foundation and second year courses to third and fourth level.

Residuals The amount of variance in the spread of the pass rates explained by the model was 59 per cent for UNED and 78 per cent for the Open, which could therefore be judged as good. The size of the residuals was relatively small, evidenced by the fact that there were only four outliers in the two groups.

Philology had an unusually high pass rate in 1977 (44 per cent) and an unusually low one (22 per cent) in 1980. The pass rates for Philology have been in decline since 1977. Law has an unusually good year in 1977 with 37 per cent passes. These figures are relative to what is predicted for a Carrera from the model. In the Open there was only one outlier: Social Science, which had a "bad" year in 1977 with 66 per cnet passes. This is explained by the relatively poor examination results in that year rather than course abandonments. This result typifies the differences between the two universities: an unusually poor pass rate in one (Open) would be an unusually good one in the other (UNED).

DISCUSSION

The batches of data in the two universities were similar in having distributions that were highly irregular in pattern and large differences in the numbers of students in faculties and on courses and asignaturas. This justifed the use of EDA. Similar also was the pattern in that abandonment of asignaturas of courses carried greater weight in determining the overall pass rates than failure in the examinations, although this was less marked in the UNED. Sharp contrasts are found in the results themselves. If median course results are taken as the norm, then one third fewer Open students are seen to abandon their course and one third more to be successful in their examinations, which gives a pass rate in favour of the Open of double. The Open student has two chances in three of passing, the UNED student one. What has brought this apparently dramatic difference?

Explanatory Model

A model, theory, or conceptual scheme with which to work is important when looking at student response, however defined and measured. (Lucas and Crown, 1974). My model is B = f (P,E), where B = student behaviour, P = personal characteristics, and E = academic environment. This gives importance to student-environment "fit". It assumes that a student in difficulties in one environment might well work effectively in another.

How far differences in the P component, if any, of the Spanish and United Kingdom students might have affected pass rates I am unable to say, having no evidence beyond demographic data. A review of recent literature on student characteristics and their predictive potential for academic achievement concludes that results are not optimistic, often contradictory, and on the whole account for little variance beyond that accounted for by tests of intellectual ability. (Margrain, 1978). Whether the Open students are more "intellectually able" than the UNED's there is no evidence to show, even if it were possible to define how such a factor might be measured. But it must be noted that the UNED students are subject to entrance qualification conditions before registering for a carrera, which is not the rule in the Open. It might then be thought that the UNED students should do better since apparently they would be more ready by virtue of satisfying the necessary preconditions than the Open students. But around two thirds of the Open entrants have some form of academic qualification, and previous research in the Open suggests that level of entry qualification increases the likelihood of course passes.

For my purposes the E term of the model seems more fruitful for explanations. Less attention has been given by researchers into the possible effects of differences in academic environments and effects on student response than to personality correlates of performance, but profitable studies have been made which point up possibly important dimensions (Gaff et al, 1973, 1976; Ramsden 1979)

This environment includes a full range of complex and interrelated variables like field of study, course organisation, methods of assessing and examining, and the degree of contact between staff and student. My explanation must be limited to the possible effects of differences in one dimension of the environment strategies - assessment strategies.

Database Differences as a Causal Condition

The baseline from which results are calculated are not exactly equal in the two universities: UNED calculates from initial registration, the Open calculates from Final Registration, a period in which some 25 per cent of students either do not take up the offer of a course for which they are Conditionally Registered or after they have taken it. Final Registration takes place some two months after the course has begun. So it is difficult to put a figure on the number who start their course and then abandon it. But this does not affect examination passes: 69 per cent of the UNED students pass as against 91 per cent of their Open counterparts, a sizeable difference.

Again UNED courses/asignaturas carry less working load than Open courses. Since the mode is for students to enrol for around 3 - 4 courses (UNED, 1977:198), compared with around 1½ course credits for the Open, abandonments look greater in comparison. If an UNED student drops three asignaturas, this is roughly the equivalent to an Open student's dropping one full credit course. The difficulty here lies in the non-equivalence of course weights.

Cultural Differences as a Causal Condition

The wide scatter of results around the averages both within and between the carreras seen in the UNED data in contrast to the patterns seen in the Open require explanation. No doubt this compressed pattern in the Open derives from the influence of the extensive guidelines provided for both the part-time and full-time staff members when grading both course and examination work. This steady state makes decisions for future planning and administration such as forward projections of student input and output much easier for the Open than the UNED staff.

The psychology and technology of the teaching and learning arrangements are similar across faculties and courses. These features no doubt make for greater conformity in results. But the general blandness in the Open results raise the question of whether there are group pressures to conformity at work. In the Open it is perhaps easier than in a campus environment to look over one's shoulder to see what other people are doing and to be influenced. Results too for any one year are automatically compared against a background of previous year's results which are continually publicised. Within the Open, with its high technology "unusual" results in high failure rates would probably lead to hypotheses of poor teaching as a causal condition and call for examination. The same argument applies to the UNED, but the impression is of greater autonomy for carrera staff and less guidance and rules.

Differences in pass rates can reflect technical differences in departmental criteria and cultural differences, since there is no absolute benchmark as there is, say, in reading temperatures. Standards of examining may differ. Within the professional examination system in the United Kingsom in fields like accountancy, law, surveying and engineering - professions which govern the calibre of their own entry - greater percentages fail than in universities. So the same might apply in Spain where the history of curriculum development is linked with the professions as Horovitz (1974) and Moncada (1972) show. The comparatively high rate of failure may be due to jealously guarded standards and the vested interests of senior faculty.

Assessment Strategy Differences as possible Causal Conditions

Assessment philosophies and systems are sharply discriminated in the two universities, which possibly mirrors inter-country differences.

Continuous assessment is now popular in the United Kingdom. What is the best system of examining and assessing a student's academic performance in higher education has been a crucial issue, and some thorough analyses with subsequent practical recommentations have been made. (e.g. Polytechnic of Central London, 1971). There seems general agreement that how a student performs in his course work in essays, term papers, projects, laboratory experiments - even teamwork - should count toward final assessment together with formal exams. Diligence is rewarded, motivation more likely to be sustained, skills and abilities of a different nature assessed. James (1973) has shown how student rankings differ when one method or the other is chosen. This argument is accepted by the Open University and explains the use of the two components. More Open students may come forward for exams because their continuous assessment scores give them a chance to predict the likelihood of success in exams. The combined continuous assessment and exam result also reduces the chances of bias in the scores due to comparatively severe or lenient marking.

A most interesting and important tendency is that rather more than half (65%) of the Open students who pass their formal examination gain at least a grade or so higher on continuous assessment than on their exam results (Open University, 1978b). No study has been made on how results might be affected were examination results only to be the performance criterion as it is in the UNED. But this fact strongly suggests that pass rates would probably fall slightly.

Further analysis of the same document showed that Open students in Maths, Science and Technology are likely to benefit more from continuous assessment. Some students actually do better in formal examinations, but it is interesting to see that they are more likely to be Arts, Social Science and Education students.

That students in technical and mathematical subjects should tend to perform less well in a formal exam context than in their course work makes sense. Under exam conditions time constraints operate. These can handicap students who, normally (as in course work), could devote more time to, and need more time for, solving problems. The course work conditions mirror more conditions experienced in the normal course of technical or professional work. It is noticeable that UNED students on the technical and scientific side seem to fare worse than their counterparts on the "verbal" and more loosely-coded discipline sides like Law and Philosophy and Letters. If that can be found to be true in further investigation

it may suggest that verbal subjects are more easily learned than technical ones, in distance education. The sort of student may make a difference: the Philosophy and Letters has a greater volume of female students than the technical faculties. So there may be a sex by field of study interaction. This would be worth investigating.

CONCLUSIONS

When brought together for comparison the published results for undergraduate courses in the UNED and the Open may lead a person to conclude that the UNED students trail far behind their Open counterparts in academic performance. This would be to ignore a number of artefacts like different databases, work load, and even data reduction techniques and measures which produce different pictures and so interpretations and evaluations. Judging from just one year's performance rather than a run of several years could also mean false impression. Because of what I see as artefacts rather than differences in properties of the personal and environmental independent variables which affect the dependent variables of performance, the UNED is perhaps "disadvantaged" in this comparison. But given that qualification, and taking into account a number of adjustments to the data, if the percentages of students presenting for examination, passing them, and getting approved are the criteria, then the conclusion must be that the UNED students come off second best to the Open students. The smaller scatter of the latters results also means more accurate predictions for decision making purposes.

But I must also qualify this by saying that one must recognise in making judgments that money costs, "survival rates" and qualitative as well as quantitative data are crucial in judging and have not been explored.

The better results in the Open cannot pass without question. At first glance they seem somewhat "unnatural" in the broader context of expected results for university students in their almost unchanged nature year by year and by the small spread around the averages irrespective of faculty or of course. This is in contrast to the UNED results. The almost predictable nature of the examination pass rates is perhaps unusual. Does this relative cohesiveness in results mean a more cohesive staff?

Perhaps more valid comparisons for distance education can be made with institutions in the host country. For instance taken against the losses in registered students in higher education currently running at 50-70 per cent in Spain (Villanueva, 1980:56), the UNED's results take on a different picture. Of course, I am talking here of abandonments of university education - a different event. How many of the students whom we designate as "abandoned" in the data actually dropped out of the systems we do not know. This could be the subject of further research since numbers who drop out - or the converse, "survival rates" - are important criteria in judging the efficacy of a system.

In searching for causal explanations of differences I do not see at this stage that cross-cultural studies of distance-learner characteristics would be very worthwhile for reasons given earlier when arguing about a model that should dictate research strategies. A more detailed search for differences in academic environments at

15

university and faculty level could produce some interesting findings. The differences could be in organisation of the curricula, the time students have for study, the understanding between teacher and taught, room for students' own interests, differences in teaching-learning arrangements, amount of prescription in the programme, and so on. This is a very long haul for any investigator, but baseline data on these dimensions of the environment obtained from cross-cultural studies could provide the beginnings of hypotheses for testing.

The major issue raised in this comparison has been about the possible effects of differences in assessment strategies in discriminating performance. What might have happened to the results in the UNED had adopted a weighting system in which marks for the distance exams in the components or units of the asignaturas had counted 50:50 in the assessment with those of the two formal exams? If the Open experience is anything to go by, there is a strong likelihood that more UNED students would receive the grade "aprobado" than has been seen in the past four years.

REFERENCES

Erickson, B.H. and Nosanchuk, T.A. (1979) Understanding Data. Milton Keynes: The Open University Press.

Gaff, J.G. Crombag, H.F.M. and Chang, T.M. (1973) The University as a Learning Environment. Report No. 13. Educational Research Center, University of Leyden, Holland.

Gaff, J.G. Crombag, H.F.M. and Chang T.M. (1976) "Environments for Learning in a Dutch University." Higher Education, 5, 285-299.

García Garrido, J.M. (1976) La Universidad Nacional de Educación a Distancia. Su Implantación y Desarrollo Inicial. Barcelona: Ediciones CEAC.

Horowitz, M.A. (1974) Manpower and Education in Franco Spain. Hamden, Connecticut: The Shoestring Press.

James, A (1973) "What does Course Work Predict?" Universities Quarterly, 27 (Spring), 217-222

James, A (1982b) Contrasts in the Organisation, Practice and Results of Spain's UNED and the UK Open. (Mimeograph) A Report: Milton Keynes: The Open University, Faculty of Educational Studies.

James, A (1982a)Universidad Nacional de Educación a Distancia In G Rumble and K Harry (Eds) Distance Teaching Universities London: Croom Helm (to be published)

Lucas, C.J. and Crown, S (1974) "Concepts and Methods in Student Mental Health." British Journal of Psychiatry,125, 595-603

Margrain, S.A. (1978) "Student Characteristics and Academic Performance in Higher Education: a Review". Research in Higher Education, 8, 111-123.

Moncada, A (1972) "Directions of Development in Higher Education in Spain." World Yearbook of Education

Perry, W (1976) Open University: a Personal Account. Milton Keynes: The Open University Press.

Polytechnic of Central London (1971) Examinations and Assessment. The Report of the Working Party. London: Polytechnic of Central London.

Ramsden, P (1979) "Student Learning and Perceptions of the Academic Environment." Higher Education, 8, 411-427

Tukey, J.W.(1977) Exploratory Data Analysis. Reading, Ma: Addison-Wesley.

Villanueva, J.R. (1980) "Present and Future of Higher Education in Spain." Higher Education in Europe, 5, (April-June) 51-57

University Reports, Documents, Statistical Sources

UNED (All published by the Ministerio de Educación y Ciencia)

1976 Organización de la UNED.

1977 La UNED Vista por sus Alumnos

1979 Guía del Curso 1980/81

1981 La UNED y sus Alumnos. Curso 1979/80.

OPEN

1978a Examination Procedures. Document EB/78/4

1978b Report on Examinations and Assessment 1977. Document EA/65/3

1979 Assessment Fact Sheet. Supplement to booklet "An Introduction to the Open University."

1981 An Introduction to the Open University. Booklet.

Statistical Sources for Open University Course Results

1979–80 Final Course Results Documents EA/81/3; EA/84/2.

1978–81 Examination Analysis of Courses. Statistical Bulletins SB/78/79/80/81.

ACKNOWLEDGEMENTS

I should like to thank the following persons for their constructive comments. Mr. John Bibby, Mathematics Department of the Open University for suggestions about the statistical analysis, Dr. Pío Navarro Alcalá-Zamora, Director of UNED's Instituto de Ciencias de la Educación, for comments of results, and Dr. Eduardo López López, Faculted de Ciencias de la Educación, for general comments.

THE OPEN

Faculties

Year		Arts	Social Sc	Education	Maths	Science	Technology	Total
1977	N	(20)	(20)	(12)	(14)	(21)	(16)	(103)
	a	19308	16129	8291	9495	9166	12391	74780
	b	15489	12330	6097	6425	6873	9053	56267
	c	14269	10647	5659	5885	6274	7777	50511
1978	N	(21)	(23)	(12)	(15)	(23)	(19)	(113)
	a	19130	16106	7260	10237	10165	12991	75889
	b	15438	12373	5331	7067	7238	9054	56501
	c	14069	11131	4877	6350	6621	8097	51145
1979	N	(23)	(22)	(11)	(15)	(23)	(21)	(115)
	a	20614	15082	7672	11573	11098	12972	79011
	b	15910	11345	5376	7750	8082	9007	57470
	c	14328	10260	4838	6941	7403	7972	51742
1980	N	(23)	(22)	(12)	(18)	(26)	(22)	(123)
	a	19194	14867	6914	12133	10116	12802	76025
	b	14751	11090	5000	8348	7253	9005	55447
	c	13521	10046	4593	7490	6635	8084	50369
Total	N	(87)	(87)	(47)	(62)	(93)	(78)	(454)
	a	78246	62184	30137	43438	40545	51156	305705
	b	61588	47138	21804	29590	29446	36119	225685
	c	56187	42084	19967	26666	26933	31930	203767

APPENDIX A

Undergraduate numbers by Faculty and by Year over the four academic years 1977-1980

a = numbers enrolling for asignaturas (UNED) and courses (Open)

b = numbers presenting themselves for examination

c = numbers of examinees approved

(N) = numbers of asignaturas/courses per faculty

THE UNED Departments or Carreras*

Year	N	1 Dero (25)	2 G e Ha (20)	3 Fila (24)	4 Educ (26)	5 Econ (23)	6 Empr (25)	7 Fis (16)	8 Mat (17)	9 Quim (19)	10 Ing (21)	Total (216)
1977	a	25150	10778	6458	20676	12953	9817	3218	3743	2684	4306	99783
	b	11345	5669	4732	10383	3793	2900	1593	1462	964	1584	44425
	c	9246	3473	2822	5362	2814	1965	635	825	444	611	28197
1978	N	(25)	(25)	(29)	(32)	(29)	(31)	(21)	(23)	(23)	(25)	(263)
	a	37662	13396	6992	24159	14301	10972	3361	4554	2967	3120	121484
	b	14105	4973	3278	7332	4464	3315	1157	1390	726	1227	41967
	c	11856	4310	2696	6089	3590	2639	789	1065	564	660	34258
1979	N	(25)	(26)	(29)	(31)	(29)	(31)	(21)	(23)	(23)	(29)	(267)
	a	40062	12936	6523	15158	15309	12253	4168	4119	2834	4407	117769
	b	14848	8671	4836	11605	5802	5124	1496	1645	1012	1629	56668
	c	11271	3851	1813	5334	2945	2297	1044	1215	706	1034	31310
1980	N	(25)	(26)	(29)	(31)	(30)	(31)	(21)	(23)	(23)	(29)	(268)
	a	41823	13996	6154	14620	10869	10272	4539	4606	3163	4462	114504
	b	16955	9303	4132	9621	5667	4925	1987	2197	1129	2007	57923
	c	13051	3837	1357	5013	2930	2418	1151	1325	708	1017	32807
Total	N	(100)	(97)	(111)	(120)	(111)	(118)	(79)	(86)	(88)	(104)	(1014)
	a	144697	51106	26127	74613	53432	43314	15286	17022	11648	16295	453540
	b	57253	28616	16978	38941	19726	16264	6233	6694	3831	6447	200983
	c	45424	15471	8688	21798	12279	9319	3619	4430	2422	3322	126772

* Departments 2,3, and 4 belong to the Faculty of Filosofía y Letras
5 and 6 belong to the Faculty of Económicas y Empresariales
7, 8 and 9 belong to the Faculty of Ciencias
Derecho and Ingeniería Industrial are separate faculties